

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

MAR. 27, 1950



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WHO'S WHERE

Changes

► **New Appointments**—Raymond J. Ford has been named senior manager of Continental Motors aircraft engine division, succeeding A. Vindenberg who recently resigned. F. Kent Bushnell, a new and manager of Ford's Aircraft's sales and service dept. Dr. Milton Lee Chao, chief of mechanical and equipment systems for El Segundo plant of Douglas Aircraft, has been appointed president of the engineering and head of school of astronautics at Purdue University.



Travel Log

Secretary of Defense Louis Johnson sets on a brief high stop Visiting Island in southern Puerto Rico and subsequently returns from total rest at Vandenberg, El Segundo offices and area, various fort and USAF combat units during Operation Pattern Lt. Gen. W. H. H. Marsh Jr., commander of defense forces in the great economy, replaces a missing commander. In being requests from Seattle, and two USA officers are hired to complete a B-40 Stinson reconnaissance base of major Strategic Air Command bases in this country by Mar. 31. Representing Boeing are Leslie M. Wood, chief engineer, W. H. Cook, vice-president and project engineer, George S. Schmitt, manufacturing and power plant staff engineer, Kenneth H. Miller, assembly assistant, and Richard Chapman and Henry Richmond, service engineers. With them are Capt. J. H. Schuler, AMC B-47 project officer, and Maj. Gay M. Townsend, chief of AMC Consolidated Flight Test section.

Honors and Elections

James Ladous, Flight Safety Foundation president, has been appointed a member of the committee on existing problems of NACA.

INDUSTRY OBSERVER

- USAF order granting of Republic P-44C Thunderbolt fighter will be withdrawn this week as fast as corrective reports and flight tests on this model. Engines trouble was traced to No. 2 bearing lubrication system on the Allison J-35-17 engine and in kits have been shipped to P-44C: base manufacturers for the repair.
- Fieseler's H-21 helicopter has a flying price of \$300,000, the USAF disclosed last week, and is designed for a capability of picking up six litter patients while hovering at its objective for 30 min., and returning to a base less than 200 miles distant.
- Grumman is developing a "VIP" version of the North Star DC-6M for use by Canadian Prime Minister St. Laurent and other Canadian officials. Powerplants will be Pratt & Whitney R1800s instead of Rolls Royce Merlin. Plans will be used by the RCAF for high-altitude and long range crew training when not hauling top brass around and will carry cross-modification for a double crew.
- Watch for off-the-shelf periscope by Navy of some balloons for anti-submarine warfare, preliminary to the design competition for new and larger models still definitely planned. Most likely candidates are Sikorsky HO4S and Fairchild PRP-2, with the Sikorsky model probably standing the better chance due to earlier possible delivery.
- Swedish reports about the suspected Flying Barrel J-29 jet fighter is the latest fighter craft in production "in the world" and that it has attained speed of 950 mph. Approximately 300 of the planes have been completed at the underground Linköping works.
- Goodyear Aircraft Corp., with three seaward diadems available for dry ship-to-ship towing, proposes a program to make strakes available to its customers for 145 permitted flying in, a search for an aircraft from May 1 to Nov. 1, with aircraft's tops displayed on the ships in the daytime and synchronized blinking signs at night.
- High-speed test of the Northrop X-43 Flying Wing resulted in the plane soaring over, catching fire and burning at Edwards AFB. Flight crew escaped. Tests called for raising the plane faster than 100 mph and raising the noseboard. Shortly after it was lowered again it disintegrated violently and collapsed at the test field.
- Pratt & Whitney's PT-2 turboprop is due to make its first flight in April in the nose of a B-17 flying test bed. PT-2 is expected to be competitive in power with the turbojet unit Allison T-40, rated at 3500 shaft hp.
- CAA plans to test 100 hr. flying time for 10 engines in the Boeing Stearman, Lockheed Constellation and Convair-Lear for flight proficiency and performance. CAA also proposes to test a Curtiss Wright Delmar flight simulator trainer for \$50,000 for a year's term, for training its pilots in two-engine procedures.
- Assistant Air Force Secretary Harold Stuart is conferring with aircraft manufacturers and service operators in an effort to get a clear standardization on surface transport requirements which can be standardized more completely with military transport requirements.
- Westinghouse Electric Corp., Gas Turbine division expects to assemble its first J-34 turboprop engine at its newly opened Kansas City plant this month, and to be producing parts and assemblies at Kansas City by May. Ultimate goal, to produce about 100 engines a month, is expected to be reached in a year. Plant is the war-baby factory previously occupied by Pratt & Whitney. It is expected to be the most complete self-contained jet engine plant in the country, when auxiliary wall installations are all completed.
- Continental Motors disclosed in the most annual report of the corporation that it has been working on a ram-jet engine development for at least a year.



Are you taking full advantage of the constantly growing range of forgings? Typical is this aluminum alloy forging with a projected area of more than 1,000 square inches used in the wing structure of a modern military bomber. Such forgings are today made possible by the use of the largest die forging press in America (18,000 tons).

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Company	Record 1949	Profit ¹	Record 1948	Profit ¹	Working Order 1949 Year-end	Orders 1949 Year-end
Boeing Aircraft	279,511,806	982,887	234,446,120	25,211,426	56,285,412	211,800,000
Boeing Aircraft	16,000,000	206,943	17,176,043	97,120,000	N/A	N/A
Boeing Airplane	227,012,528	5,431,546	127,504,664	1,711,589	46,000,000	255,000,000
Consolidated Vultee	227,345,475	3,717,136	131,501,600	15,711,794(1)	27,407,717	207,000,000
Convair	126,416,264	1,750,364	101,138,568	5,117,265	78,112,000	112,700,000
Douglas Aircraft	119,423,233	6,116,700	120,007,516	5,829,262	17,120,000	215,400,000
Farwell E & A	N/A	2,250,220	26,038,075	1,011,011	N/A	74,000,000
General Aircraft	18,565,777	3,251,220	18,107,119	1,412,711	N/A	10,000,000
Lockheed Aircraft	113,427,668	4,492,473	120,086,110	5,219,395	29,782,000	219,740,000
Marin	51,425,543	111,000	71,000,000	14,000,000	41,000,000	71,000,000
North American	129,728,400	3,185,400	94,701,729	8,719,254	41,000,000	200,000,000
Pennaco	1,022,442	309,944	3,800,000	10,417	126,000	10,200,000
Republic Aviation	67,122,795	175,000	50,071,051	2,118,475	126,000	8,800,000
Republic Aviation	15,000,000	187,012	146,000	146,000	3,400,000	5,800,000
United Aircraft	227,000,000	18,000,112	200,000,776	8,410,717	79,400,000	112,000,000
TOTALS	\$1,407,426,341	\$50,071,707	\$1,111,011,130	\$12,042,445	\$771,711,220	\$2,061,198,700

¹ Before tax.

² After tax.

³ First year ending Nov. 30, 1949.

⁴ Second year ending Nov. 30, 1949.

⁵ Third year ending Nov. 30, 1949.

⁶ Fourth year ending Nov. 30, 1949.

⁷ Fifth year ending Nov. 30, 1949.

⁸ Sixth year ending Nov. 30, 1949.

⁹ Seventh year ending Nov. 30, 1949.

¹⁰ Eighth year ending Nov. 30, 1949.

¹¹ Ninth year ending Nov. 30, 1949.

¹² Tenth year ending Nov. 30, 1949.

¹³ Eleventh year ending Nov. 30, 1949.

¹⁴ Twelfth year ending Nov. 30, 1949.

¹⁵ Thirteenth year ending Nov. 30, 1949.

¹⁶ Fourteenth year ending Nov. 30, 1949.

¹⁷ Fifteenth year ending Nov. 30, 1949.

¹⁸ Sixteenth year ending Nov. 30, 1949.

¹⁹ Seventeenth year ending Nov. 30, 1949.

²⁰ Eighteenth year ending Nov. 30, 1949.

²¹ Nineteenth year ending Nov. 30, 1949.

²² Twentieth year ending Nov. 30, 1949.

²³ Twenty-first year ending Nov. 30, 1949.

²⁴ Twenty-second year ending Nov. 30, 1949.

²⁵ Twenty-third year ending Nov. 30, 1949.

²⁶ Twenty-fourth year ending Nov. 30, 1949.

²⁷ Twenty-fifth year ending Nov. 30, 1949.

²⁸ Twenty-sixth year ending Nov. 30, 1949.

²⁹ Twenty-seventh year ending Nov. 30, 1949.

³⁰ Twenty-eighth year ending Nov. 30, 1949.

³¹ Twenty-ninth year ending Nov. 30, 1949.

³² Thirtieth year ending Nov. 30, 1949.

³³ Thirty-first year ending Nov. 30, 1949.

³⁴ Thirty-second year ending Nov. 30, 1949.

³⁵ Thirty-third year ending Nov. 30, 1949.

³⁶ Thirty-fourth year ending Nov. 30, 1949.

³⁷ Thirty-fifth year ending Nov. 30, 1949.

³⁸ Thirty-sixth year ending Nov. 30, 1949.

³⁹ Thirty-seventh year ending Nov. 30, 1949.

⁴⁰ Thirty-eighth year ending Nov. 30, 1949.

⁴¹ Thirty-ninth year ending Nov. 30, 1949.

⁴² Fortieth year ending Nov. 30, 1949.

⁴³ Forty-first year ending Nov. 30, 1949.

⁴⁴ Forty-second year ending Nov. 30, 1949.

⁴⁵ Forty-third year ending Nov. 30, 1949.

⁴⁶ Forty-fourth year ending Nov. 30, 1949.

⁴⁷ Forty-fifth year ending Nov. 30, 1949.

⁴⁸ Forty-sixth year ending Nov. 30, 1949.

⁴⁹ Forty-seventh year ending Nov. 30, 1949.

⁵⁰ Forty-eighth year ending Nov. 30, 1949.

Big Year Assured for Plane Makers

Backlogs and better facilities add up to best business outlook since war ended.

By William Kruger

The one-and-a-half-billion dollar aircraft manufacturing industry is taking off on its biggest postwar boom.

Any outfalls and cringes on military expenditures—such as located about Washington—can't stop it.

Gross income and profits will be up in 1950.

Deliveries will be of larger size. That means higher revenue. And efficient production methods will assure more profit out of every income dollar.

Political changes in a slow-down on government expenditures probably will get harder before it does. But it is expected to die after the full election. Even if government outfalls are announced, they will not seriously affect industry results much before mid-1951, leading manufacturers predict in their 1949 annual reports.

• **Why It Looks Good—**Postwar outlook for the industry is based on a backlog in excess of \$2 billion, and expanding and looking activity last year that set up the plan for better output this year. Fact that manufacturers such as Robert Grum, of Lockheed, and Donald Douglas believe this year will be better than last has significance.

• **Every company made a profit in 1949**

for the first time since the war, it is disclosed in Aviation Week's compilation of annual reports latest out of the plane manufacturers and engine contractors. Aggregate profit more than tripled over 1948.

• **Postwar high in deliveries was attained in 1949 by several companies.**

The optimism reported by the manufacturers regarding isn't put for stockholder consideration. Operational facts make it patently.

TRANSPORT BOOM

Saggingly, there's a mild lull in commercial transport business. But it isn't the industry wide commercial backlog this year that there was a year ago, but on the other hand, there wasn't supposed to be. The transport business was supposed to be carrying time until the advent of turbine power. Instead, Douglas, Lockheed and Martin are looking sensible new business and Boeing and Convair that, prospects are bright.

Douglas has orders for 33 DC-6 types for 1949 delivery. Its commercial backlog has more ships over the 1948 year end figure. Lockheed has orders for 41 Constellation for \$48,000,000. Its commercial backlog passed from only \$34-129,000 at the end of 1948. The Convair

production line will be busy for another year on what Lockheed says is 40 percent of the industry's total commercial backlog.

Martin's business on 4-4 transports for Eastern Air Lines and TWA is much newer (Aviation Week, Mar. 15), but it propels the trend.

The commercial transport outlook is dashed by Boeing and Convair. Both have cancelled deliveries on their new orders. But both are hopeful that they can generate new business for turboprop models of their transports, and both will be in production for some on military versions.

• **Jet Transports—**Boeing, Martin, Convair and Douglas say they are ready to convert their existing transports—the Stratocruiser, 2-4-2, Convairliner and DC-6 to turbojet power. Post jet power is a different story. Douglas and Lockheed are studying and waiting—let by different means.

Douglas indicates that the power engineers are moving too fast for any manufacturers to firm up an engine design. "In one model alone," Donald Douglas tells his stockholders, "within a period of four months three power contracts of more than 100 percent have been secured." Under such circumstances, obviously it is assumed... to be... design of any airplane to fit a power unit which can become obsolete almost immediately.

So Douglas will wait, but ready "to move ahead rapidly as this field."

Comparative Backlogs

Company	1948	Year-End Backlog 1949
Beech Aircraft	\$16,000,000	\$13,000,000
Bell Aircraft	30,000,000	N.A.
Boeing Aircraft	445,714,875	365,849,690
Consolidated Vultee	116,000,000	207,000,000
Curtiss-Wright	127,000,000	112,750,000
Douglas Aircraft	233,589,000	275,499,000
Fairchild Aircraft	94,206,000	N.A.
Grumman Aircraft	107,000,000	194,000,000
Lockheed Aircraft	195,661,830	229,746,000
North	88,097,541	73,675,000
North American	380,000,000	228,000,000
Pittsboro	N.A.	10,200,000
Republic Aviation	72,000,000	16,814,000
(As of 3/1/49)		
Ray Aircraft	11,700,000	4,800,019
United Aircraft	315,000,000	393,000,000
TOTALS	\$2,261,658,246	\$2,041,996,709
N.A. = Not Available		

Lockheed has a different reason for holding back on jet transports. "The cost of developing airplanes has multiplied many times," President Cress reports. "Added to this are the lengthy and costly process of certification by CAA and the fact that competition has been more sharply felt in jet planes."

"We have taken the position that modern air transport is an essential part of our national defense and that participation in development of new transports is a proper function of the armed forces."

MISSILE HEDGE

Next to atomic weapons, guided missiles developed in order to overcome the rocket armament blanket. This year, the manufacturers give a closer idea than ever before of how deeply they're in the missile program.

Most manufacturers are in one place or another of guided missile work. They can't tell much about what they are doing, but more into that category is a new strand of the aviation industrial fabric—electronics.

Texas and places strange to aircraft manufacturing are the tip-off arm players, nuclear missile technology, telecommunications, guidance systems. But the aircraft manufacturers have shown greater adaptability to get along in the new field.

•Convair has missile contracts with both Air Force and Navy and is involved in development of both fusages and internal components. Convair's MD-774 Air Force missile already has been tested.

•Curtiss-Wright is working on power units for guided missiles.

•Douglas is developing more than 50 per-

cent of the engineering effort at the General Motors plant to guided missiles. Convair is the prime contractor on two guided missile projects and proudly boasts that its "insuper" (WAC) missile has "earned the Douglas missile a record of 250 miles and a record speed of 5000 miles per hour."

•North American is in production on two types of missiles for the Navy, the large Viking missile rocket, two of which have been fired, and the KDM-1 target generator. Caltech IV, used as a target drone. Company has 300 engineers working on design and testing of the control radio systems, missile guidance systems, instrumentation devices and antennas for airborne test. Reflecting the change that has come over "aircraft manufacturing," more than 25 percent of these engineers hold doctor or master of science degrees.

•North American now has 900 employees in the electronics section, an increase of 775 a year ago, who play their role with such facilities as a supersonic wind tunnel (the industry's largest) and control engine test center.

•Boeing has completed a contract for the Air Force, the F-104, for the Air Force, and is continuing guided missile work for the Air Force and Navy.

EFFICIENCY

Manufacturers are making more money with fewer employees. More and better machines is one reason. Another is better bookkeeping. Spurring the development in many cases is the government's cost-plus contract which prohibits the company and government split any savings over the target price.

As example of how it goes is found at

Lockheed, F-80 jet fighters now are being delivered at one-fourth the cost of the first experimental models, and four-fifths the cost of the planes of the first production order.

It will take only modest in many instances to produce the 200th. Consolidation this summer is due to produce the 100th about three years ago. At Douglas, production economies enabled the company to take 10 percent off its spare parts prices.

•Lockheed and McDonnell are the main reasons for the Lockheed performance is the \$5 million it has put into new facilities and equipment and what the money has bought. Such areas as a 250-ton metal stretching press, \$351,000 worth of parabolic and standard tools, 10-ton Cero strong beams, 8000-ton trapezoidal hydraulic press to be installed late this year, a \$466,000 new building for the new machinery.

Other companies, notably Curtiss-Wright and North, lightened up production efficiency with new jets or new in new places. Management reorganizations accounted for much of the increased savings (page 16).

•Sperry Rand—There was no least among the major companies in 1949, but some shared common rules and profits. In one case (Bell) this was due to a strike, the sharp cutback at Boeing, however, was due to discontinued production following a strike in 1948.

The total backlog of companies is porting was down over the 1948 year-end figure. One logical reason was the good production record. Here's the reason—a cut in individual company receipts during several reports.

BOEING

Like many another manufacturer, Boeing reported production reaching a postwar peak. By last week all but one of its 53 Stratofortress had been delivered, 47 for sale to airlines. "Deliveries" deliveries of B-49 bombers and C-97 Stratofreighters were made. Early in the year, Boeing-Wallace cleaned up its order for 11-15 Scout bomber planes.

Most of the plane deliveries in 1949 rolled out of the Seattle plant. In the year immediately ahead, that situation may change. The B-47, says Boeing, looks now as if it will be the company's principal production item. It will be produced in Wichita.

But for the rest of this year, and into 1950, C-97 production will continue at Seattle. As the last of the present order moves down the line, Boeing hopes right behind it will be a Stratofortress version.

•The Seattle-Borg, President William M. Allen indicated that Seattle will always be the company's home and headquarters. The facility that last year brought in the industry's biggest sales

In the Air with Boeing's Flying Boom



STEP-BY-STEP PICTURES, just released, show details of new Boeing Flying Boom aerial refueling system in actual mid-air operation. Above photo, taken from side lighting B-29 tanker, shows B-50D flying on fuel hose through telescopic boom.



FROM THE NOSE of a B-50, the B-29 tanker looks like the last of its kind the boom to refuel the Superfortress. End of the pipe still opened up on top of the bomber's fuselage. Fuel is pumped by the tanker at high speed into the bomber's tanks.

and backlog (see table) will be the center of Boeing later engineering and research work.

At Seattle Boeing is developing the flying boom refueling system, the X-45 bomber, small gas turbines for industrial use and guided missiles.

CONVAIR

Consolidated Vultee was one of the three companies to show a loss in 1949. Last year it turned up with a speaking \$1 million loss, but that and some because previous years' losses carried forward, left no net liability. And there is

and left about \$8 million of year year losses in 1949 against the liability for this and subsequent years.

When Floyd D. Gilman assumed control of Convair, he made no secret of his desire to shift the company's future on military business. Growth of Convair's military backlog indicates at least temporary success. In 1948, Convair

•Sold \$167 million to the Air Force; \$6 million to the Navy, \$24 million to commercial customers.

•Got contracts for 25 more B-56 fighters and 40 T-39 two-engine trainers, and is negotiating for more B-56 bombers.

•Shaved backlog at \$187 million in Air



VARIED "BUDDY" roles, before refueling point in boom, stand out sharply in the side view of operation. Their leading edges carry R. F. Goodrich wing-wing strips extending behind wing. Sky way does not extend during actual flight.



STOWED AWAY, the Remond-developed Flying Boom refueling pipe is shown in a close-up as it is inspected by a flight test crew. Support rigging, holding boom in place, also can be seen in side view of the boom. Note anti-wing struts.

Force business, \$10 million in Navy business, and less than \$1 million in commercial business.

Convair was on trouble in keeping its two plants (Ph. Worth and San Diego) busy. At Ph. Worth in the B-56. At San Diego in the T-39, parts for the B-36 and major assemblies for the B-50, awarded under contract with the Boeing company.

CURTIS-WRIGHT

Real test of the new management at Curtiss-Wright will come this year. Results of the last six months of 1949.

Temporary Truce on Air Budget

House group tentatively approves President's 1951 AF and Navy aviation budgets, but hits fund impounding.

Temporary truce between Congress and the Administration over strength of the Nation's air power resulted last week when House Appropriations Committee tentatively approved the President's proposed \$37.5 billion Air Force and \$14.6 billion Naval aviation budgets for the 1951 fiscal year essentially intact.

Shifting \$49,963,000 from defense-related and operational accounts, the House tentatively approved a \$5,000,000 USAF budget (\$4,886,513,000 cash and \$10,238,000 contract authorization). The Budget Bureau has recommended \$5,214,268,000 (\$4,634,777,000 cash and \$6,612,599,000 contract authorization). The committee approved \$1,612,462,000 for Naval aviation, making a slight increase (the housing) over the \$1,512,352,000 proposed by the Budget Bureau.

This is the program which the funds would implement.

- **Strength.** Air Force would operate 43 groups (including four obsolete groups) and 13 separate squadrons, approximately the same as the current strength. The Navy would operate 49 combat units, 19 carrier groups, 12 Marine air squadrons, 20 patrol squadrons, 3 amphibious squadrons, one patrol unit with 75 fast jet aircraft (14 carrier groups, 13 Marine groups, 30 patrol, and 10 amphibious squadrons).
- **Procurement.** USAF would procure 1983 aircraft, as against 1200 for the current year; the Navy would procure 512, predominantly air defense, aircraft, as against 793 procured during the current year.
- **Research and development.** USAF would have \$25 million available, compared with \$22 million during the current year; the Navy would have \$74 million, compared with \$77 million this year.

Disparities indicated, however, that the fighting spirit against the Truman-Bohrer defense-reducing program is still strong in Congress.

House Appropriations Committee, in its accompanying report, balked at spending the Administration's reduction in USAF strength by the 51 groups provided for by Congress for this year to 48 groups. "There is no serious justification for the throwing of a major policy of Congress by repudiating of funds. In this principle of throwing the budget at Congress by the 51 groups of funds should be accepted in earnest, then Congress would be totally incapable of carrying out its constitutional mandate of providing for the defense of the nation," the committee said.

• **No Executive Cuts.** Legislation barring executive cutbacks (over five per cent) in defense appropriations with the consent of Defense Intelligence Committee was introduced by Chairman Carl Vinson (D, Ga.) of the House Armed Services Committee. It has the unanimous backing of Vinson's majority on the committee (12-1), chairman of the Appropriations Subcommittee of the Armed Services, commented, "All other committees have voluntarily complied with our committee."

Congressmen expressed apprehension over military reports of the country's diminishing air strength. Maj. Gen. F. H. Smith reported that the reduced procurement program now would lead to a decrease of USAF's standing from about 134 modern groups in 1955 to 108. Vice Adm. Jola H. Cassidy testified that at the present procurement level, the Navy's present combat strength of 4331 operating aircraft (4339 regular, 444 reserve) would be reduced to 3000 in six years.

Following are details on 1951 fiscal year funds for USAF approved by the House Committee:

- **Procurement.** \$1,310,290,000 (\$1,304,000,000 cash and \$10,290,000 contract authorization) with a \$720,150,000 carry-over from last year, the total fund availability will be \$2,030,440,000. To finance this, \$1,523,000,000 will be to finance existing contracts and the remaining \$1,513,440,000 will be applied as follows: Aircraft construction, \$1,001,184,303; guided missiles, \$17,000,000; electronics, \$13,000,000; industrial mobilization, \$1,597,992, per account, \$153,800.
- **Research and development.** \$132,611,000—with a carry-over of \$22,461,000, expounded by the President this year, this will be a total availability of \$155,072,000. It will be used \$152,534,800 for research, \$128,750,000 for development, \$12,400,000 for operational engineering, \$13,150,801 for management and operations, and \$480,770 for pay accounts. In research \$13,600,000 for guided missile projects. Both were approved by the President.
- **Maintenance and operation.** \$1,640,000,000—reduction in \$1,662,000,000. The Budget Bureau's proposed \$1,641,000,000, which the committee said could be met through efficiency measures. USAF will support 215 installations, compared with 248 which were backed this year.

- **Ministry operations.** \$1,245,000,000, a reduction of \$9,975,000 in the Budget Bureau's \$1,254,975,000 recommendation for travel, clothing, and subsistence pay. USAF plans a \$16,000,000 savings over the current year's light budget from the current \$17,000.
- **Administration.** \$183,620,000, a reduction of \$2,020,000 in the Budget Bureau's \$185,640,000 figure.
- **Components.** The House Committee approved the Budget Bureau recommendation for Navy USAF reserve, \$75,251,000; Reserve Officers Training Corps, \$10,830,000; Air National Guard, \$103,933,000.
- **Real Property Construction.** \$25,000,000—the amount recommended by the Budget Bureau. USAF reported that with this budget it will have a total availability of \$31,445,000 to move forward with its five program (the radio tower, the long-range guided missile program, in Florida, the Air Support Development Center, Alaska research and mobilization). USAF reported that all \$10,000,000 of the \$30,000,000 appropriated by Congress for AEDC five year was frozen by the President, and that only \$200,000 has been obligated to date.

The House Committee approved the \$1,895,496,000 (\$1,880,000,000 cash and \$475,000,000 contract authorization) recommended by the Budget Bureau for Naval aviation program.

With a \$124,797,000 carry-over, the Navy will have a total availability of \$1,720,293,000. Of this, \$170,000,000 would be used to liquidate current obligations, leaving \$550,293,000 for obligations, as follows:

- **Planned aircraft procurement.** \$637,637,833 (Navy disclosed it contains plus procurement of \$4,600,000 lighter-than-aircraft).
- **Planned aircraft.** \$110,000,000.
- **Mobilization.** \$260,500,000. \$18,000,000 will be used to equip aircraft for amphibious warfare, including nuclear weapons, magnetic detection.
- **Technical equipment for engine training.** \$1,700,000 (\$133,899 for engine, \$180,000 for electronic equipment, \$103,000 for armament).
- **Outstanding for new aircraft.** \$1,547,000; salary increases, \$68,145.

The \$177,346,000 approved by the House Committee for naval aircraft and facilities was slightly less than the \$178,796,000 recommended by the Budget Bureau. It includes:

- **Research and development.** \$74,775,685—includes \$74,775,685 for guided missiles, \$13,360,390 for guided missiles, \$1,616,164 for power plants, \$13,094,245 for electronics, \$10,491,307 for supporting program.
- **Industrial mobilization.** \$4,004,491.

- **Flight operations.** \$62,467,000. This would support 5989 operating aircraft on the regular Navy, 4799 combatants and 3511 logistic support aircraft. The committee said \$798 operating aircraft are planned for this year.
- **Alcohol overhead.** \$13,384,225.
- **Station operations.** \$187,796,590 to maintain 50 stations, 35 continental and 15 extra-continental. This compares with the current \$135 continental and 17 extra-continental.
- **Alteration and replacement of facilities.** \$14,366,300.
- **Supporting equipment and services.** \$20,526,231.
- **Naval Reserve.** Flight operations, \$20,714,300; aircraft overhead, \$13,707,990; and for station operations, \$9,067,167.
- **Administration.** \$3,417,136.

Potent Punch

Rocket-armed B-36 may revolutionize bomber-fighter tactics.

USAF will test an all-rocket-armed B-36 late this summer when Air Force officials expect will revolutionize present bomber-fighter defense tactics.

Meanwhile, aircraft and bomber design experts are completing modifications to USAF headquarters for transmission to Wright Field where aircraft modification will be made. Plans is to install six thrusts of two rocket launchers—each forward, two top-side,

one each port and starboard, and one in tail.

Present armament consists of 36 5000 lb bombs in 12 tunnels which are controlled by a G-6 control gun control system.

Plans will directly affect long-range plan of USAF to replace conventional machine gun with rockets on its fighters, assigned to intercepter missions. Conventional 50 caliber machine is already obsolete in view of one-speed rate of closure of present fighters.

• **Blackburn Aircraft.** Blackburn-11 tests are successful and ground development testing has indicated that airborne tests will be conventional machine gun on the top bomber as scheduled for early engagement by rocket intercepter missiles, having a five-mile range and later utilization of a missile with a 30-mile range.

Indications are that the B-36 rocket weapon test will be made under the Black Hawk, B-36-90A, the old major development in the Air Force scheduled for test this year. The highest rocket has an estimated gross weight of 75 pounds, including a 10-lb warhead. The new rocket has a speed of Mach 2.

• **General Aircraft.** General Aircraft is in the midst of development in its existing pilotless aircraft. As a result USAF is concentrating on its active value losing device. The electronic device gives the missile to an standing craft regardless of evasive action taken by the enemy.

Under the missile weapons could make the missile almost invulnerable to a possible aerial defense as that ability of an interceptor to meet within range.

of the bomber would be negligible. Plans is feasible due to ability of B-36 to carry heavier, longer-range rocket missiles than an attacking interceptor. Rocket and missile, according to missile experts, at maximum order might or an enemy, track the interceptor at maximum speed, and so-called "hit and run" by means of a proximity fuse.

Despite difficulties in absolute ground intercept, radar guidance mechanisms are already in an advance of missile engines and fuels. "Boosters" for missiles have been developed and are in test which can guide a rocket with a Mach 2.0 speed with minimum range sets up to 2000 miles. Extensive tests of USAF is to reach an intercepter combat capacity in the 5000 miles range by 1955.

AF in Quadrant Over Fairchild Successor

General Max S. Fairchild, 55, Vice Chief of Staff, USAF, died of a heart attack at his quarters in Washington last week, leaving a vacancy in Headquarters Command which will be difficult to fill.

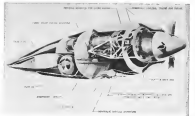
General Fairchild was promoted to major last March 23, 1943, when he was appointed Vice-Chief. When USAF Air Command was opened at Maxwell AFB in 1946, Fairchild was named commanding general of that installation. He remained at that command until advanced to Vice Chief two years ago.

He had organized and directed the activity to be what he termed a progressive program which material of a place to hold a post-mortem on World War II.

His death leaves Air Force as a quantity as to who might fill the vital second-in-command executive post. While some observers lean towards Lt. Gen. Louis H. Stinson as likely successor, some observers believe his youth and lack of top administrative experience may preclude his nomination to the position.

Ranking officer in the Air Force, General Ralph T. McFarlane, is serving as special assistant to Defense Secretary Robert A. Lovett. It is that McFarlane would be a logical candidate because post would be a step-down in command responsibility.

Most likely candidate is Lt. Gen. Nathan P. Twining, due to be replaced in Alaska in June by General Norstad. Actually there are seven names eligible for the post. These are: Lt. Gen. John S. Graves, Gen. George C. Kennerly, Gen. C. Wheland, Kenneth D. Wells, Major General (now retired) Vice-Chief of Staff, Thomas and Norstad. Nomination to the post will not be made for at least 15 days.



SALES & SERVICE

Insurance Plan for Fixed-Basers

Arrangements by America with NATA and AOPA are expected to cover 2000 operators, 10,000 planes.

Arrangements under which aviation insurance coverage will be provided to members of two aviation groups, the Fixed Base Operators, who are members of National Aeronautics Traffic Area and the members of Aircraft Owners and Pilots Assn. are being finalized by the American Insurance Association Co. (America), Washington, D.C.

G. Whelan, American president, foresees a potential of covering approximately 2000 operators in NATA and coverage on approximately 10,000 planes in AOPA.

Coverage of the NATA members according to a plan compiled by American, NATA and National Insurance Underwriter, St. Louis (AVIATION WEEK Jan. 16) is expected to be split between NIO and American as a geographical basis. American will handle East and West Coast states, and NIO will have the middle section of the U.S. More specifically, American will cover Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, West Virginia, California, Washington, Oregon, Arizona, Nevada, Idaho, Utah and District of Columbia. NIO takes the rest of the country.

► **Expense Rating—Operators' coverage will be as an individual experience plan subject to individual inspection of the airport operators, for final determination of the rate quoted.** Whelan expects to write contracts on an hourly basis for larger operators, if business warrants it.

Typical of the type of business American expects to write on the airport operator field, was the company's trial experience with 180 operators in the calendar year of 1949, with an average premium pool of \$14,000. Loss ratio for these operations was "substantial" for the company, Whelan said.

► **Remittance—Coverage will include fire, theft, vandalism and liability.** Whelan expects to reimburse to protect his company against liability or property loss above \$5,000 in any one claim and over \$15,000 maximum loss on a "catastrophe" such as a major fire, tornado etc.

A newspaper inspection report from

which is used in containing an operation to determine how it shall be rated, classifies such items as aircraft, maintenance facilities, flight operations, charter operations, pilots and instructors employed, aircraft rental practices, pilot and instructor, fire protection, construction of buildings, airport layout, including fencing and perimeter control, fueling facilities, insurance equipment, air pilots, insurance and experience of management, either of bookkeeping and records, whether operation will continue after GI flight training program is phased out.

► **AOPA Contract—AOPA's contract with American guarantees that the insurance company will provide "the broadest coverage obtainable at a substantial discount from normal rates."** Whelan stated that his company "intends to maintain" an rate differential below annual rates in the event that other companies adopt by Jan. 1, 1950, published rates.

Typical of American rate "indications" for AOPA members are:

► **Aircraft hull.** Rate of \$1.70 per \$100 of insured value for general coverage only on a basis of 50-99 percent of the manufacturer's list price for a plane with last year model \$40,000.

► **Aircraft liability.** \$12 premium for \$5000-\$10,000 coverage for bodily injury liability including passengers; \$15 premium for \$5000 limit property damage liability; \$15 premium for \$5000 passenger bodily injury liability (1 unit); \$5 premium for \$5000 medical payment liability for pilot, and \$4 premium for similar liability for each passenger.

For aircraft over \$15 thousand value and for multi-engine aircraft, coverage is added to complete application forms and submit them for rate quotations.

► **Non-Owners—Liability coverage for non-owned aircraft, for planes which this company has not yet owned, will be provided for bodily injury liability, property damage and passenger liability, at rates 75 percent of those quoted for planes owned.**

American is a new insurance company, but its president has been active in aviation insurance for many years, and operates his own Beech Bonanza.

His new relationship with AOPA, follows a previous contract arrangement with the pilots and owners group under

which Lloyd's of London was the insuring agency in an arrangement made by Whelan.

BRIEFING FOR DEALERS AND DISTRIBUTORS

► **AIRPORTS RATED—Of the nation's 6000 civil fields, only 11.5 percent are rated "above average" or "superior" by AOPA members in the recently completed 1949 rating period.** California, ranking second in number of airports, had the largest number of rated airports. Rating system is based solely on reports received from members during the year.

► **COMET CRUISE—In only four months, a Monrovia, Ltd., pilot and captain piloted 2000 ft. of glide while driving a wind power line installation by Eberhard Faber Co., Honolulu. Operation is said to take a maximum ground crew about two hours.**

► **AIR MARKER AID—Worth of its services can be attested to by two Air National Guard fighter pilots who were unable to get into Logan Airport, Boston, because of snow and only had 15 min. gas supply left. They spotted a commercial marker which guided them to a 2000-ft. landing area at Revere, Mass.**

► **MUST READING—Approaching spring good flying weather also causes extreme atmospheric instability making for frequent disorientation and head-aches, and pilots and operators would be advised to break up on their weather knowledge. Good material on these unbreakable weather phenomena is found in CAA, Bulletin No. 15, titled "Meteorology for Pilots," written by S. C. Hovius, U.S. Weather Bureau.**

► **NEW FLOTTOFF FROP—A convertible-type prop in 15.5 hp. range selling for as low as \$1500 is being produced and marketed by Flotoff Mfg. Co., Grand Rapids, Mich. Of Beech-Robey design, the new prop has plastic-coated blades and stainless steel leading edges.**

► **WIN A PRIZE—Aeromarine Poplar Dr., Koppin Co., has opened a page contest for its dealer and distributors. They are being asked to submit ideas on upping Aeromarine sales and to complete the following page.**

There was a young pilot named Hugh,
Who bought a plane made of bamboo,
How his girl got under,
And a plane made of wicker.

First prize is a year's subscription to *Aviation*, second prize a year's subscription to *Look*, and five prizes of a year's subscription to *Coronet*.

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INTER DUCT SKIN
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Hufford process extruded skin. 14 ST to 16 ST. One extruder, one extruder, one extruder, one extruder, one extruder, one extruder.

FUSelage FRAME
Formerly made of two 20" sq. Now welded together, then 10" heat stretched and formed. It now stretch-wrap formed in one operation from a single formed box section.

TAIL PYLON SKIN FORMING
Formerly required 5 operations to complete this part—19 size wire stretch-wrap plus two operations on a drop hammer. Now stretch-wrap formed on a Hufford in 40 seconds.

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What Is Actual Value of Service Testing?

Students of question say that one way to find out is use of probabilities methods of evaluation.

"What does service testing prove?" That is certainly one of the most hotly debated questions in aviation. The student says all the way from "everything" to "nothing," with the proportion of technical opinion on the line.

Data is as available as air, and a medium culture as to be largely available in the charts. Yet many of the early conclusions were pure guess work based entirely on such data. If such a debate could be confined to the realm of hazy speculation, its heat could be contained, satisfactorily, however, its outcome has vital economic consequences to the powered and these have attracted such proportions as to demand an immediate answer.

► **Military Practice**—The first question to be answered is "What has been the experience to date on the usefulness of aircraft service testing?" Methods used by the military service vary widely from those used in civil aviation.

Service testing is a large and separate branch of the aircraft procurement function is the Air Force. The Air Force normally places its service test quantity of aircraft, usually 15, built and flown widely for service test purposes. This test quantity will account for about 25,000 hours of flight time on the group, will require more than a year, and will cost about \$7 million.

Accordingly, on the basis of this figure, the approach to the problem is reducible for the commercial aircraft, both as to the expenditure and as to the time involved.

► **Manufacturer, Aikido**—On the commercial side, the aircraft manufacturer accumulates 100,000 hours of flight time on his prototype at his own expense. This flying is basically in the interest of performance, stability and cost determination, but the fact that it is an accumulation of flight time on the airplane makes it inseparable from service testing.

The regional office of the Civil Aeronautics Administration then selects the airplane to 75-100 hours of flight time to determine if its performance, stability and control meet aircraft requirements.

The airplane is then subjected to the currently required 100-hour CAA "accelerated service test," but all flight time to this stage of the program has been financed by the manufacturer.

The plane then is turned over to the purchasing airline, which is required to operate it on a 100-hour proving run over each week in its planned to operate the plane. This testing is supported by the Air Carrier Operations Manual of the CAA.

In addition to this required flight time, the manufacturer will usually have flown the airplane an additional 100 hours on discretionary flight for other accident tests, oblique and modifications developed by the owning company, sales tour, etc.

Then, a new transport airplane has received 300 to 1000 hours of service testing by the time the first other passenger flight about.

► **How Opposite Differ**—And yet what has this 1000 hours of testing proved? Three major postwar transport aircraft have been produced at production cost less than \$100,000, although each of them had been tested for thousands of flight hours (including time in passenger service) prior to the accident. It is on the basis of this evidence that participants in the debate must that service testing proves nothing.

The solution proposed immediately following these accidents invariably was "Subject new aircraft to longer and more rigorous test periods before certifying them for passenger carrying."

But is this the answer? Many engineers say no, and hold that even an unusually high number of test hours does not insure against a sudden failure in the next hour. All agree that service testing is required, most agree that even an huge accumulation of time is absolute proof of safety.

The solution to the problem, obviously, is to determine the true importance of service testing and then place its value in accurate perspective.

► **Question Posed**—Is the case of commercial aircraft, its value must be determined in economic terms, by definition. That this concept tends dangerously close to placing a dollar and cents value on human life is unavoidable,



Fig. 1. Second form of insurance: faults in aircraft operation.



Fig. 2. General form of cost variation for design error correction.

for the moral obligation involved does not admit to selection of any critical tests. The question, then, can be rephrased "At what point in aircraft service testing does its cost begin to outweigh its value?"

If that point can be determined with reasonable accuracy, then the optimum number of service test hours will be conveniently defined.

► **Final**—We will start flying by the word "worth," all of the things that we go wrong, ranging from a single "blow" due to complete destruction of the airplane to a crash. This definition obviously excludes the pilot's judgment, in which many errors can plainly avoid all technically derived weaknesses.

Basically, there are two types of aircraft fault—design errors, and weaknesses of equipment, generally defined under the term "maintenance."

► **Curve Representation**—Fig. 1 presents the general lines curve for the variation of these two types of fault with hours of aircraft operation. No accuracy whatever is claimed for the curves shown, they are intended to show only the general relationship.

No claim is made as to the relative positions of the two curves, each may be lower or higher, depending upon the appliance in question.

It is the slope of Fig. 3 that faults due to design error and faults due to maintenance follow opposite trends.

► **Design Errors**—It is seen that design errors are manifest immediately upon beginning of flight test and, as these are progressively corrected, diminished rapidly until they approach zero. It follows that the greatest number of these are detected during the manufacturer's initial flight test of the appliance, the second greatest number during the CAA flight test, the third greatest by the accelerated service test and fourth greatest by the service proving test. This adds its own small percentage error to the appliance developer's discovery. The number of design errors until virtually none are uncovered.

The curve does not purport to reflect the relative consequences of various errors, since this is manifestly unsupportable. Nor can we say whether acceleration of a fault test very forward of a later or initial overhaul more serious consequences than use of a stepped wedge design between service and initial overhaul sections. The ordinate simply the faults developed per test time.

► **Costs Considered**—Turning now to Fig. 2, we attempt to express the relationship in Fig. 1 in economic terms by breaking down the cost of faults into its two components—cost of operating the appliance during the test and the cost of correcting the design error.

It is seen that the most rapid expenditure for correcting design errors is at the initial stage of the test. This follows from the more frequent occurrence of design errors in the initial flight test stage, as shown in Fig. 1, and, in addition, the greater expense of faults at this stage, since the most serious errors are discovered first. The curve of flight time cost to develop these errors, it, of course, assumed a straight line. It will be remembered that the ordinate in Fig. 2 is total cost and not a rate.

This figure indicates that at some flight time the cost of merely flying the appliance is as much as to discover design errors equally and then expend the cost of correcting the error. This chart is not only useful for determining this point but permits some arbitrary percentage of error to be computed.

For example, the number of flight hours required to detect 50 percent, 75 percent or 90 percent of required engineering errors can be determined readily by a horizontal line located at the desired percentage point on the ordinate and its intersection with the curve line.

► **Maintenance Facts**—Fig. 3 is a plot



Fig. 3 General form of cost variation for maintenance



Fig. 4 General form of cost variation for fault correction

extension of the maintenance side of the picture. The above, again, is loosely approximate and the ordinate is arbitrary. The dashed horizontal line represents the standard revenue per unit, such as passenger miles, airplane miles, airplane hours, etc.

The two-plus intersection of some number of hours of operation at which the cost of maintenance just equals the revenue from operation of the appliance. The area between the two curves to the left of this intersection indicates profit, that to the right indicates loss. Obviously, at the time these two curves intersect, operation of the appliance will no longer be profitable.

It is the purpose of Fig. 1 to show that maintenance difficulties are irregularly an economic function and that when they approach operating revenue the appliance is automatically retired because of economic considerations alone and without necessity for regulation.

This study, then, would tend to eliminate maintenance difficulties as a logical target for service test and remove the problems of their discovery from considerations as a service test function. This does not mean that their discovery is not an important function of service tests but indicates that they need not be subject to service test regulation by the government, since they are automatically handled by airline economic considerations.

► **Total Cost**—Total cost required to develop and eliminate faults in a new transport plane is shown in Fig. 4, a plot of the combined cost of flight time, the correction of design errors and maintenance.

This figure shows the cost of faults perceptibly in the early stages of testing, looks out for a period of flight hours, then begins to diminish. The level portion of this area in operation which design errors have been reduced to the level of maintenance, so that the latter becomes of more or perfect economic concern than the former. To the right of the point maintenance causes the curve to climb up again until the appliance is retired.

This figure can also be interpreted to show that the rate of expenditure for fault discovery and correction drops to a minimum at the point indicated by the level portion of the curve.

► **Cost Division**—Fig. 4 also is used to indicate the respective regions of responsibility of the manufacturer and the CAA on the one hand, and the air carrier on the other. It would appear that it was the responsibility of the first group to reduce the cost of developing and correcting design errors to the level of daily maintenance costs and that at this point then joint responsibility ends, both economically and from safety considerations.

The graph also indicates the limit to which the manufacturer can economize by expected to go in absorbing the cost of fault discovery and correction. It is clear that the carrier's expense does not start until the level part occurs.

Furthermore, the manufacturer's costs have been given a pocket response, whereas that facing to the right of the level portion of the curve is that due to the airline in carrying maintenance. The dotted line indicates the maintenance cost against flight time costs, which are not distinguishable in fact. In discovery, more the appliance is being flown in regular operation.

► **Analysis Possible**—It is the purpose of the foregoing to indicate that their costs represent but the minimum cost of the service test problem and that the various considerations, particularly those dealing with the manufacturer's responsibility, can be debated.

It further indicates that the results to be expected from a given quantity of service test time can be predicted with reasonable accuracy. Generally, it is not necessary to know whether or not all of the "bugs" have been worked out of an airplane so to determine the amount of service testing required to accomplish that end.

All that is required is a means of determining what percentage of "bugs" a certain amount of service testing can reasonably be expected to work out.

It remains now to develop data by which the ordinate and abscissa of the accompanying charts can be expressed in numerical, and therefore real, form. Income, losses, aircraft accidents and deaths of flight safety

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Poisson's Distribution

Each of the probabilities of the various faults to be considered are multiplied together to obtain an overall probability of occurrence. The cases of five distributions, as shown in the following function:

$$P(x) = (1 + \frac{x}{n})^n \cdot e^{-x}$$

The results obtained from this computation give Poisson's exponential series.

Foundation, has suggested that there are depreciable means of accomplishing this job.

It is his opinion that aircraft "bugs" occur as random events and not within the laws of probability. If the latter is true, the problem would be greatly simplified and the familiar binomial distribution of "bugs" could be used to predict the frequency of their occurrence.

Poisson's Distribution—Leiderer suggests, however, that use can be made of Poisson's exponential function for solution of the problem (see box). This is simply a special case of the binomial distribution to include a generalized random distribution. This function is useful in solving problems relating to the occurrence of random events.

It is currently being used in England in studying the incidence of air traffic accidents. It is also being used in the U. S. in studies of industrial accidents to determine insurance rates. But C. F. Pozzani, head of the AIA technical service, has suggested that data available from the Daily Mechanical Engineer Reports of the airlines to the CAA can be used to determine the probabilities involved in Poisson's formula.

The precision of these data is a simple computing job, but what is required is a study of the applicability of these methods to the problem.

Several manufacturers plainly have stated that they cannot stand further extension of service test time as it is strongly desired by the CAA. Because of the absence of these required data, the CAA, the Air Line Pilot Association and some airlines strongly urge additional service test time requirements in the conviction that this is the only reliable path towards a greater proportion of "bugs" in a new plane.

It is believed by many engineers that the availability of probability data combined with considerations of the extension of the problem will provide a more rational approach to the problem of aircraft service testing.



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Famous last words: "I won't tell you I've got too much air speed!"



You won't hear a crack like that from *AN-6209* or *NAVY* aircraft flying, because they know you are still in high speeds.

But—there are still plenty of high-speed planes who figure they are the exception to the rule of high-speed planes.

Actually, you can't hear a high-speed plane at any place. This moment in sudden deceleration or critical flying because it's a plane rough on both plane and pilot.

Always remember: it's a given to speed, you can't hear the high-speed plane or pilot only on sharply. Try to control your plane's limitations and—run it, such a proceeding path, too!

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Al—has there a pilot ever in *LeCompte's* engine? If the lights burn a little less than usual, it's a few scheduled flights and maintenance. Maintenance is a P. M. job, not a C. H. job. Check regularly for P. M. Air.

For his L. K. (both proof, and you), that great percentage has named the most successful maintenance of French Pilot (C) —"become ramp," that is.

New, A. P., if you'll just forget your

engine for a moment and come down from the clouds, we'll make with you L. K. P. A. W. K. P. (For those guys who



control. Little Known Fact About Will Knows: Please.)

"Due to bad consumption, the flying time of our plane was in light of a rate equal to one adult passenger dismounting every 3 minutes."

Your Commission is my name, A. P., we're out the pit edge home.

Hey, you, the guy wearing a chair

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Illustration: SEAM WELDER built especially by
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cal process for the solidification of soil
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converted into an adequate landing strip
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much as 35 percent water by weight
can be given a tough, rubbery texture
suitable for landing operations within
few hours after treatment.

► **Soil Locked**—Developed at Massachusetts Institute of Technology under
supervision of Eugene Research and
Development Laboratory, Fort Belovs,
Va., the process uses calcium oxyphos-
phate, a chemical absorbed by soil particles.

Two other compounds employed are
sodium formate and ammonium
phosphate. These last cause the cal-
cium oxyphosphate to lock to-
gether, so that, in effect, the soil particles
are joined in the "skeleton by-
standards" in a fast chemical reaction.

► **Strength** Data—Tensile strength of
the soil five hours after treatment is
from 740 psi. If the surface is allowed to
dry for a week, this may increase to
780 psi, with accompanying loss in
plasticity. But reversing the soil returns
it to elastic and tensile strength condi-
tions that exceed five times after treat-
ment.

In recent MIT tests, a 3-in. thick soil
block subjected, without settlement in
distention, the weight of a car moving
over it 24 hr. after treatment. A 16-lb
steel ball dropped from a height of 7 ft.
rebounded about 6 in. without damage
to the test section.

► **Cost** High—MIT is optimistic that
current tests now being conducted will
prove that the process is suitable for
use under unusual high and low tem-
perature conditions. Present costs of
the chemicals are said to be high, but
it is believed that mass production of
these products would lower their cost to
a reasonable level.

The development project was guided
by an MIT steering committee, and
administrated directly by Professor John
R. Wilson, head of the MIT's civil en-
gineering department.

Besides Wilson, other members of
the steering committee were Dr. Har-
old C. Weber, professor of chemical en-
gineering and chairman of the commit-
tee; Dr. Ernest A. Hansen, also professor
of chemical engineering, in charge of all
chemical work on the project; Dr. F.
William Lenz, assistant professor of
soil mechanics and executive officer of
the project; Donald W. Taylor, assoc-

36 HARTMAN RELAYS PROTECT BOEING'S B-47 BOMBER



36 GC-18 28-Volt
Control Panel.
Photo Courtesy Jack H. Hartman
Electronic Industries, Inc.

Midfield of the lightweight
efficiency and trouble-free perfor-
mance of Hartman remote control cir-
cuits and other d-c devices in military
and civil aircraft, Jack H. Hartman
called on Hartman to supply vital

relays for the J4H GC-18 control
panel installed in the Stratocruiser.

Each of the aircraft's six gener-
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an individual GC-18 control panel
equipped with five Hartman relays.

- (1) **Differential-Voltage and Reverse-Current Relay**—Connects generator
to bus when generator voltage exceeds battery voltage; disconnects generator
from bus upon reversal of current.
- (2) **Ground Fault Relay**—Closes ground fault; when fault exceeds set value,
closes generator generator.
- (3) **Overvoltage Selector Relay**—Selects load generator to drive generator
producing overvoltage and automatically sets in overvoltage relay to stop
at lower voltage than other five relays.
- (4) **Regulator Relay**—Disconnects regulator supplying current from generator
bus to avoid pulling system voltage down when generator is unresponsive.
- (5) **Overvoltage Relay**—Selects overvoltage and cuts out generator. Relay
has inverse time characteristics to prevent nuisance trips.
- (6) **Contactor and Disrupter Relay (Now Slowly)**—Located in fuselage near
main bus, one of three contact units, each controlled by a GC-18 panel, con-
tacts and disconnects generator from bus during both starting and generat-
ing conditions.

Typical of Hartman design and
manufacture, relays in the B-47
are just a few of the many d-c devices
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etc. professor of aeronautics, also
for J. Rose, associate professor of
highway and airport engineering, and
Dr. Francis E. Voss, assistant pro-
fessor of aviation.

Shop Courses Held For Martin Designers

Shop indoctrination courses for design engineers and draftsmen have paid off in reduction of basic production costs, according to William F. Goetz, supervisor of change order in Glenn L. Martin Co.'s engineering department. Part of an overall program to promote efficiency and economy, the courses have been stressed because it is estimated that fully 30 percent of the fabricated value of an aircraft is usually under the control of the design engineer.

Growth of the industry has made it imperative for engineers to follow their designs as to the shop floor to observe detail manufacturing sequences. And it is imperative for the building specialist to be called upon for advice in cases that a small fraction of the daily costs in which the designer's decision affects fabrication costs. For example, as production drops of one plane alone, about 100 men are at the drawing boards.

Goetz says: "There it is, wholly in the factory substructure for a refresher system which places they know how directly into the design engineer's hands—the man whose decisions, made heading at the initial stage of each airplane's manufacture, dictate precisely what factory processes are to be employed."

"Just such a program of training, one that brings engineering personnel—including supervisors and assistant heads—in direct contact with the shop and its people, has set up."

More than a hundred engineers, in groups of 25, have already taken advantage of these shop indoctrination courses. Meeting in the evenings, groups first attend a lecture stressing the comparative cost factors involved in forming and fabricating by alternative methods. They then visit the shop-for-demonstration.

"The courses cover the various standard operations in the shop and the nature and purpose of each process involved. Following an operator's demonstration wherever possible, individuals of the groups themselves participate—often accomplishing hand jobs, shearing, rolling, welding, explosive cutting and even drop hammer operations."

Various detail parts are shown there—mechanical items being constructed with expedient parts made from revised designs. The sessions usually close with questions and answers.



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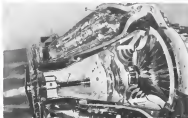
DOUBLE MAMBA

PROPELLER TURBINE

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AERONAUTICAL ENGINEERING BRANCH OF THE HAWKER SIDDELEY GROUP

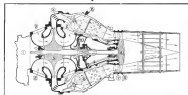


Front and (1) forward in intake, (2) rear view, (3) compressor forward view, (4) accessory drive gear, and (5) oil pump.



Middle section: (1) compressor rear view, (2) rear air inlet, (3) turbine vane at end of air duct in combustion chamber, (4) fuel line, (5) fuel nozzle and swirl vane, (6) combustion chamber Narman lines, (7) shaft, turbine housing, (8) turbine shaft bearings.

First Cutaway Views of J-42 Turbo-Wasp



Sketches: (1) accessories, (2) air intake, (3) compressor, (4) fuel nozzle, (5) igniter, (6) core heating chamber, (7) guide vane, (8) turbine blades, (9) disk, (10) cooling passages.



View looking forward: (1) swirl vane, (2) cooling air nozzle, (3) turbine casing, (4) turbine blades, (5) fuel nozzle, (6) exhaust case, (7) exhaust cone, (8) thermocouple for turbine inspection.



Looking at: (1) cooling passage (the large passage is 18 in., providing 1600 lb. air per hour at 12,500 rpm), (2) cooling air nozzle, (3) turbine casing, (4) rear support, and (5) turbine.

Certified by the Civil Aeronautics Administration in July, 1949, for civil applications, Pratt & Whitney's J-42 Turbo-Wasp has been in production for over a year. The engine has successfully completed a 500 hr endurance test at the P&W labs.

Thrust rating set at 5750 lb. Overall length is 115.2 in., diameter is 49.5 in. Gross weight is 1723 lb and specific fuel consumption is 109 lb. per lb. per hr. thrust.

The powerplant is in use with the Grumman F7F Panther in several Navy squadrons in carrier service and in a Marine Corps squadron.

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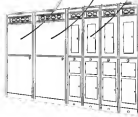
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Extra Blood Builds Altitude Resistance

Experiments at Duke University have revealed that blood transfusions can give a man's ability to withstand high altitude.

This finding was disclosed at a recent UNESCO meeting at Lima, Peru, by Dr. Frank G. Hall, Duke physiologist. Hall was chief of the Army Air Force physiological branch during the war and wrote the first directives for training aviators in the use of oxygen and related equipment at high altitudes.

In tests at Duke, five students who were given an extra pint of blood and then placed in a decompression chamber, were able to withstand 2000 ft. more altitude than usual. Loss of blood would the opposite way. Four subjects who gave a pint of blood last up to 2000 ft. altitude resistance. Reason given for this is that in giving away some of their blood, the students cut down the reserve of oxygen normally stored in their bodies.

Tolerance to high altitude was measured by a subject's "interval of useful consciousness." He was considered "usefully conscious" as long as he could remain alert and perform certain tasks while at a simulated altitude of 35,000 ft. Students first were put through the paces while breathing pure oxygen, then tested while inhaling the mixed air existing at 35,000 ft.

Radio Station For Measuring Ionosphere

The National Bureau of Standards has set up a new radio station, field station at Ft. Belvoir, Va., to make continuous studies of radio waves reflected from the upper atmosphere.

Designed for ionospheric and geophysical measurements, it is one of 14 stations operating under NBS's central radio propagation laboratory and part of a world-wide network of more than 50 radio observatories.

Instrumentation gathered at the new installation will aid in preparing 90-day predictions of the best frequencies for short wave radio operations, warnings of sudden radio disturbances.

Consisting of five buildings on 20-acre tract near the Potomac River, the station also will be used as a training center in techniques of ionospheric and field intensity measurements.

It is equipped with the latest type intensity recorder, ionospheric recorder and visually recording magnetograph. Studies already are underway at the new installation to further improve ionospheric measuring techniques.



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Polygraph strain gage reader, showing display board, recording carriage and control box.

Strain Gage Reading At A Glance

(McGraw-Hill World News)

London—An apparatus which automatically accepts and displays in rapid successive readings from any number of strain gages has been developed by the research department of Ampco Ltd., Birmingham, England, for testing aircraft structures.

Known as the Polygraph strain gage reader, the unit gives results in the form of half-inch graphs, each 5 by 3 in., arranged in columns on a board. Coverage—A stylus, mounted in a carriage, traveling horizontally along the board in turn, is connected, via an electric circuit, to a potentiometer, which balances, in turn, each of the Wittek-type bridge circuits. Release of every gage point can be individually checked as a test progresses.

Since the number of gages required for a test may vary considerably, the recorder has been made in 100-watt units and additional units can be added, both to the panel and at the control box.

It has been found, as a result of practical experience, that a production version of the machine could be made more compact and its recording speed considerably increased.

Advantages—The application of the Polygraph Recorder are wide. Not only is the stress at any gage point immediately visible, but the slope of the load/strain curve can be observed and any irregularities detected immediately. The apparatus is then considered of great value to the designer, who can follow closely the behavior of a test specimen.

For development testing this is a most valuable device, since it is possible to avoid a test for major reinforcements before final collapse or at

above the appropriate strength requirement. Thus, time and money can be saved and the maximum amount of information obtained from a single test structure.

Paper Setup—The method, method of recording stress is used in the equipment—Out of balancing a Wheatstone bridge with a potentiometer and measuring its deflection. The deflections are, however, instantly recorded on a large sheet of kydex paper, clamped to a large display board.

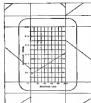
The paper is divided into 40 columns, each 3 in. wide. These are, in turn, subdivided vertically into 5 sections of 5 in. with a space between each. Every strain gage is attached one of the resulting sections—the horizontal side representing the percentage of the full load, the vertical side the percentage of strain.

The Recorder is designed in 100-watt units and, although the prototype carries only for 300 strain gages, the system can be extended by the insertion of further units.

Operations—All the electronic equipment is contained in a single control box. On the panel are mounted the apex balancing potentiometer, one for the initial balancing of every gage point. The bridge standards are also housed in this control, with a duplicate potentiometer for manual readings.

Governing the paper from left to right, at a speed of one inch per second, is a carriage which carries three styluses equally spaced as a continuous chain. This is called so that, while the carriage is moving, the stylus always takes a vertical path down the paper at the rate of two inches per second.

When a new column is reached—the carriage has moved three inches—



Typical section of polygon record, showing load/strain graph for one gage, with indicating potentiometer led over it. Average curve is shown through matrix made by stylus.

either stylus is ready at top of paper.

Potentiometer Action—The carrier potentiometer, which provides continuously, is mounted in the carriage and is geared to the stylus chain so that, during one revolution of the potentiometer, the stylus traverses one graph space. As the potentiometer balances the bridge a high voltage is passed through the stylus, which burns a spot on the paper. The next gage circuit is then continuously selected, after one revolution of the potentiometer, by means of a telephone connector switch in the cabinet, the position of which is electrically interlocked to the carriage position.

Loading Scale—To the left of the board is an enlarged loading scale. When the carriage has moved one complete set of readings, it is returned to the left of the board by a trip, which is reversible so that the travel of the carriage can be altered if all the gages are not being used.

A new loading is then applied to the structure, and the loading scale—which is, in fact, only an enlargement of the horizontal scale of the graph space on the paper—is adjusted correspondingly. This controls the position of the vertical path of the stylus.

A series of marks will finally have been plotted in succession for each strain gage. These have curves from which the behavior at all gage points can be clearly seen as the test progresses.

H. V. Clarke, chief engineer of Ampco, and research department head, are responsible for the design and development of the recorder. H. Condon, of the research department, developed the electronic details in collaboration with T. S. Pascucci, who was responsible for the construction and testing of the equipment.



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FINANCIAL

How Martin, C-W Have Improved

New managements and new policies have put the two large companies on road to better financial health.

Varying degrees of improvement as a result of new managements are reflected in the annual reports currently being released by the Glenn L. Martin Co. and Curtiss-Wright Corp.

Reviewing the financial issues of possible net losses in 1947 and 1948, Martin disclosed a net profit of \$5,831,500 or \$4.52 per share for 1949. This compares with a net loss of \$16,711,680 for 1948 and the \$19,182,000 for 1947.

In a large measure, the excellent 1949 showing may be attributed to the absorption of all possible secondary write-offs on its commercial transports during 1948 and 1947.

► **Non-recurring income.** In fact, \$675,228 previously written-off in past years for this purpose was restored to income for 1949. While paper accounting, this treatment tends to overstate 1949 earnings by the amount restored. Further analysis discloses that a portion of 1949 reported profits are of a nonrecurring nature and thus not indicative of normal earning power.

For the first time, the company has officially revealed the profit it realized on the sale of its former Chemstrand Division to the U. S. Rubber Co. That profit came to \$748,867 and was included in 1949 earnings. The company also sold apartment facilities it formerly owned at a price "in excess of their net book value." Presumably, this profit is included in the "Miscellaneous" income credits of \$151,791 in the 1949 report.

Partly offsetting profits included a recovery of lost property taxes in the amount of \$221,000 and a recovery of funds in a foreign bank amounting to \$37,129. Royalties came to \$114,074 for 1949 and are likely to be of a continuing nature.

► **Normal income.** Accordingly, adjusting for all possible non-recurring items and excluding the commercial transport unit restoration, previously written off, Martin's 1949 earnings, reflecting its "normal" manufacturing operations for the year, may be reflected in about \$3,207,781 or around \$2.85 per share.

These non-recurring adjustments do not detract from the company's get standing improvement in both earnings and financial position. After reflecting these considerations, the company

showed a net profit margin of almost 6.2 percent on sales of about \$52 million. For 1948, sales were higher, around \$72.7 million, yet the company suffered a substantial deficit, largely due to inventory write-offs on its commercial transport department.

Martin has also cleared up its tax situation, a condition which was troublesome in past periods. In a previous action, the company was held liable for \$7,874,231 in additional federal taxes on 1945 earnings. Of this amount, \$2,568,776 was paid prior to Dec. 31, 1949. The balance is payable in installments, the last due Oct. 1, 1950.

The additional tax payment is more than offset by the fact that the company was not subject to any taxes on 1949 earnings because of its carry-forward tax credits. The management believes that it has additional tax credits for future years. The company also extended, under terms of a recent settlement, to receive \$1,187,457 in executive taxes paid for 1943 and 1944.

► **Working Capital.** A much stronger balance sheet is presented in the 1949 report, in comparison with previous periods. From a paid-in subscription to the Reconstruction Finance Corp. of \$26.6 million, a natural reduction to \$1 million at Dec. 31, 1949, has been accomplished. This amount is not payable until August, 1951, and may easily be anticipated.

Despite the debt reduction program of 1949, net working capital increased to \$11.1 million at the year end compared with \$9.3 million at year end. The company's net worth amounted to \$19.6 million at Dec. 31, 1949, up from the \$17.1 million shown in 1948.

In considering upon the recent action for \$5,440,671 placed by TWA and Eastern, Martin's new financial product advances significant observations in dealing. "Although little, if any, profit may be realized directly from the contracts . . . such activity would be of major importance in retaining employment and in carrying payment of bond charges that would otherwise be borne by other producers. It is believed logical to expect, however, that if commercial production is resumed on the basis of these two orders, other airlines

will also find it to their advantage to order this equipment, in which event reasonable profits will be realized."

Yarnal Martin began at the 1949 annual and was \$73,655,800. This includes the \$33 million phase order received from TWA and Eastern.

► **C-W Goodbooks.** Progress of similar nature is revealed in the 1949 annual report of Curtiss-Wright Corp. Net profit for the year was placed in \$2,790,361 compared with \$5,313,204 for 1948. It is significant, however, that during the first half of 1949, the company lost \$1,209,100 in net earned, after tax adjustments, \$2,790,361 in the second half. The new management presumably was able to effect corrective measures after it assumed office toward the end of the first half of 1949.

The key factor in the Curtiss-Wright Corp. returns is Wright Aeronautical Corp., its principal subsidiary. Of the parent's 1949 sales amounting to \$128,574,327, Wright accounted for about 38 percent. In 1948, the Wright contribution was only 45 percent of C-W's total sales of \$111,747,627. Despite increased sales by Wright, an net income declined from \$1,577,020 in 1948 to \$1,295,835 for 1949.

► **Bookkeeping.** The decrease in earnings is attributed to the large expenditures made by Wright for engineering and research development. Such charges, billed large in the parent's consolidated report, amounting to \$11,710,865 for 1949 compared with only \$6,119,678 for 1948. The management has indicated that it has made sharp reductions in this type of expenditures.

Pointed reference is made in the Curtiss-Wright annual report to the marked reduction in the parent's net working capital position in recent years. This reduction is due primarily to the payment of dividends during 1948 and 1949 largely out of accumulated surplus developed in past years. Further, a major cause was the price reduction of \$4,234,884 for the purchase of 446,452 shares of the company's common stock. As a result, net current assets as of Dec. 31, 1949, were down to \$13,128,096, of some \$35,217,859 from 1947.

This would indicate that management is attempting to discourage any additional hopes for further refinements of its capital stock through new tender offers.

► **Bad Tax Ahead.** The management looks to 1950 and 1951 in a more optimistic because of the results expected to be achieved by its new policies. Among other things, policies as to quality control, cost control, budgeting and scheduling on a scale "not before attempted in the aviation industry" will be in effect and many of the company's hopes of regaining leadership and sustained profitable operations.

—Selig Altschul

NEW AVIATION PRODUCTS



Spotlights Production

Spotlight helps locate work in blind operations and alleviates difficulties involved in positioning large assemblies on reference welds, automatic riveting, damping and crosscrossing machines, punch and drill press.

Offered by **Sikidy Inc., Inc.**, 6915 W. 67 St., Chicago, Ill., unit is quickly attached by means of threaded stud and retaining arm. It is easily positioned on ball and socket joint and spot of the light can be adjusted down to 4 in. dia. Beam is claimed to be intense enough to be clearly visible under all sharp lighting conditions. Spotlight has telescopic adjustment and spread lens to permit sharp definition of the spot in a wide range of diameters. It can be equipped with a transformer of 110 or 220v., depending on line voltage required.



Quicker Inspection

Penetrating inspection of parts without removing from production line and minimizing use of stationary inspection machines. Pocket Controller, made by **Bell & Howell Co., Chicago, Ill.**, is multi-purpose unit suitable for checking radii, angles, chamfers, threads, small holes, odd shapes and round, radial and tangent dimensions on machined, stamped or cast parts.

The single unit takes place of many different checking devices, which otherwise would be needed to perform these various inspections.

Distributed by **National Tool Co.**, 11700 Madison Ave., Cleveland, Ohio, instrument has triple-thrust, spherically-type magnifying lens through which parts can be checked against finely etched pattern or scale. Lens has magnification of about 2 to 1.

While instrument is new in industry, it reportedly has been used in Bell & Howell's own plants for several years to check forms and sizes of punches and dies, gages, templates and layouts, forms and dimensions of many types of cutting tools, removal of burrs in cutting edges, slot holes, fine threads and wires.

In small manufacturing, maker believes comparison would be particularly applicable in general inspection work, die casting and plastic molding, laboratory work and metallurgy.

Parts Milled Faster

To increase production shop production, **W. H. Nichols Co., Warren, Mass.**, offers equipment designed to mill two or more surfaces simultaneously, but is capable of fine finish and fine sprouting. Designed primarily for automatic, light, high-speed milling operations on all machineable materials, it uses close limits, device, known as Twin Mill, has two independently geared milling heads mounted opposite each other on large and middle assemblies of conventional design. Table responds automatically between milling units.

Each head is driven by individual 1-hp. motor providing a selection of 15 spindle speeds in geometric progression.

Either head may be independently adjusted up or down, is set out. Each button control system, mounted on each head, permits operation independently or in unison, forward or reverse.

Machine table, designed for auto-

matic operation, is powered by hydraulic system allowing operator to control position, infinitely variable, hydraulically controlled cutting feed, and rapid traverse to starting position. Work must be indexed between cuts, provision can be made for automatic repetition of table feed cycle and automatic indexing of work piece.



Sealing Material

Improved Colalastic silicone rubber sponge, offered by **Consolidated Fluid Rubber Co.**, 407 East St., New Haven, Conn., is stated to be particularly suited for the fabrication of seals, gaskets and flange strips which must have high viscosity, dampening ability at extreme temperatures.

Recent developments in silicone rubber compounds permit the production of sponges with a density of 35-35 oz./cu. in./lb., which will retain temperatures ranging from -100 to 160 F.

Cell size in this product is claimed to be more uniform than in other similar structures. Material also has higher tensile, elongation and tear strength, and improved abrasion resistance.

It is available in 1/4, 1/2, and 1 in. thick sheets, extrusions and molded shapes.

Measures Fuel Flow

"Rotol" 150 gpm. rotary meter, developed by **Bowen, Inc.**, Port Wayne 2, Ind., is lightweight unit designed for use with bulkhead, pipeline and tank truck high-speed fueling operations. Device measures fuel flow through positive displacement, accomplished in precision chamber during each 34 revolution of rotor. Quick gear change permits reverse flow.

Complete dynamic balancing of rotor assembly is said to promote accuracy and lengthen meter life by eliminating hydraulic and mechanical stresses. Designed for vertical or horizontal mounting, device has stainless steel ball- and needle-type bearings on rotor shaft. Running action of unit, provided by one roller, is claimed to be free enough to offer practically no resistance to liquid flow in gravity or pump system.



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AIR TRANSPORT

Scheduled Cargo Lines' Rates Hit

Slack asks mail pay-subsidy separation; contracts 60¢-a-ton-mile for mail with 15¢ freight charge.

Exploitation of the mail and freight rates of the scheduled airlines has been urged on the House Interstate and Foreign Commerce Committee by Sherry Stewart, president, Fast Ship.

Reaching a resolution of long-standing separating airline subsidies from mail pay, the all-freight carrier president took issue with "those who would lead us to believe that a 60-cent-a-ton-mile rate is a more rate than any other discount given." He pointed to 15-cent-a-ton-mile freight rates on the scheduled lines and added, "Everybody knows it costs more to fly freight than mail. The freight carrier must select, at 15¢ per ton, to be able to make the change and handle the pay claims for each individual shipment."

■ Alternative Rate—He put his argument as an inference issue. Either the 60-cent "non-subsidized" mail rate is too high and should be drastically cut back or if and when mail pay is put on a cost-plus-reasonable-profit basis, or the regular airline freight rate has been set too low pay to meet the cost of a 60-cent carrier and mail should be boosted sharply.

Allowing a 10 percent profit, Slack said the operating cost per ton-mile under the 60-cent "non-subsidized" mail rate would be 48¢. Under the applied 15¢-cost rate to the 25 million tons miles of freight handled by American Airlines over the first dozen months of last year is 45 cents a ton-mile. His conclusion: American would have lost \$9,918,473 on the freight operation, which produced a total revenue of \$5,500,313.

If American's operating \$226,000 profit on its 1949 scheduled business is correct, Slack declared, "the amount of subsidy in that so-called 'service' mail rate of 60 cents must be tremendous."

■ Other developments—

■ Senate Intrigue and Foreign Commerce Committee, which held extensive hearings on subsidy separation legislation last year, moved forward with a comprehensive report on the subject, due for release shortly.

■ Air Transport Forum, was organized on whether there should be separation. In testimony before the House committee, ATA general counsel Stuart Tipton argued that if there is to be separation,

the Civil Aeronautics Board should be given free rein to determine service rates on the basis of its wide knowledge of airline operations.

■ Revenue carriers, fearful that separating of subsidy revenues would put airlines in a vulnerable position, asked that a study first be made "to determine whether separation is feasible." This recommendation was made in a letter to Sen. Edward Brooke (D., Calif.), chairman of the Senate Commerce Committee. If approved, the move would postpone separation.

■ Secretary of Commerce Charles Sawyer suggested a separate plan to the House committee that would result in a shift in mail rates. He proposed that operating costs be allocated proportionately to the volume of business. Since approximately 80 percent of airline business is passenger traffic, this move would leave to leave the major cost burden, and only a small portion would be allocated to mail revenue. Sawyer did not sign the plan, however, and said that determination of service rates should be left to CAB.

■ Association of American Airlines vigorously endorsed separation in testimony before the House committee. AAR has long contended that the revenue carriers have been treated unfairly in the rate, are supported by government and subsidies.

Carriers' Reports List 1949 Profits

Results of last year's traffic boom are continuing to make pleasant reading for airline stockholders.

Annual reports issued recently by United Air Lines, Northwest Airlines, Capital Airlines and Chicago & North Western Air Lines all disclose substantial profits for 1949. Operating revenues in each case were at an all-time peak.

■ January Up—Adding to the air of optimism was the fact that figures on 1949 business show that January's revenue passenger mileage on the 16 domestic airlines was up 15 percent over the same period last year. Several carriers reported three losses for the usually poor mid-winter period, and there was a sprinkling of profits.

United Air Lines' annual report for

1949 shows a \$2,349,405 net profit (\$8 cents a share) on outstanding common stock. The earnings were UAL's first since 1946 and compare with 1948's net profit of \$1,078,158.

Operating revenues last year totaled \$91,555,930, up 20 percent over 1948. Operating expenses gained only 2 percent.

■ UAL Mail Pay Down—President W. A. Patterson said the 1949 increase over 1948 actually was greater than indicated by net income. Apparently UAL's six mail payments averaged 63 cents a ton-mile, against 51 cents in 1948, \$4,949,000 against two months of \$1,250,000 in 1948. Net depreciation charges were \$12,108,000 compared with \$10,450,000 the preceding year.

United's 1949 results, as well as those for 1948 and the last half of 1947, are not final because CAB has not yet ruled a permanent mail rate for the period.

Patterson said that UAL and the airlines as a whole moved to a new level of economic stability last year. He expressed optimism over 1950 but indicated that any automatic lowering of air fares at this time could be highly destructive.

■ NWA in Black—Northwest Airlines announced a 10 percent net profit after taxes of \$1,537,519 in 1949 compared with a \$777,474 net loss in 1948. Last year's earnings equal \$1.11 per common share of stock outstanding after allowance for preferred dividends. NWA's domestic and international revenues last year were a record \$40,901,000, up 15 percent over 1948. Operating expenses rose 6.88 percent. Classpay's 93,900,000 revenue passenger miles flown in 1949 were accounted for almost 90 percent of Northwest's total passenger traffic gain in 1949.

Capital announced a net profit of \$89,176 last year (equal to 53.74¢ a common share), compared with \$125,997 profit in 1948. In addition, an \$887,991 profit was realized through purchase of debentures for sinking fund payments. Thus the net income transferred to common stock at year-end was an impressive \$1,881,679.

■ Mail Pay Down—The \$26,005,000 operating revenue in 1949 was 15 percent higher than the previous year. Passenger revenue soared 25 percent and cargo revenue climbed 21 percent over 1948 levels. On the other hand, while mail ton miles increased, revenue from that source declined \$357,000, reflecting a 31 percent cut in the unit cost of mail service to the government.

Capital's net working funds increased from \$640,000 at the end of 1948 to \$1,987,000 at the end of last year. The company paid \$995,080 in interest and more profit interest on its debentures

during 1949 and received \$2,165,000 in debentures, thereby bringing both interest and sinking fund payments to a neutral position. A \$1-million bank loan was paid off on Jan. 31, 1950.

■ C & S Business Up—Chicago & North Western reported a \$600,000 net profit in 1949 (equal to \$1.24 a share on capital stock), compared with a \$915,000 net profit in 1948. Despite the slight drop in net earnings, business last year was in many respects the best in C & S history.

The company's 1949 operating profit of \$1,345,500 compared with \$539,000 the previous year—a 31 percent gain. But in 1949 the net was higher because income taxes were reduced \$185,000 by a carry-over benefit. C & S paid a 35-cent-a-share dividend last October and was one of only three domestic airlines to make such a dividend on common stock in 1949.

■ Cargo Increased—Of the carrier's record \$12,365,000 gross revenue last year, \$4,560,000 (36.9 percent) came from passengers, \$3,330,000 (26.7 percent) from mail, \$4,290,000 (34.5 percent) from express and freight, and \$771,000 (6.1 percent) from mailroom income.

Expenditures included \$5,932,000 (41 percent) for salaries and wages, \$1,449,000 (11.7 percent) for gasoline and oil, \$1,103,000 (7.9 percent) for depreciation, \$1,139,000 (8.5 percent) for rent, landing fees, utilities and agency commissions, \$710,000 (5.7 percent) for taxes, \$603,000 (5 percent) for materials and parts, \$153,000 (1.2 percent) for food and passenger supplies, \$153,000 (1.1 percent) for recreation and \$1,141,000 (8.9 percent) for all other items.

The \$174,000 paid out in dividends was a 4 percent of common stock while the \$451,686 retained in the business totaled 3.6 percent of total revenues.

■ 1950 Prospects—C & S believes domestic business in 1950 will be as good as last year, although a recession in Venezuela's oil industry may affect the international air industry. No adverse international war prospects.

1950, the carrier will have delivery on the first of five Constellation's ordered in 1949. New Constellation DAs and DC-3s, C & S hopes the new ships will permit it to regain its full share of long-haul competitive business.

Resort Airlines Under CAB Scrutiny

Following complaints by Colonial Airlines and Eastern Air Lines, the Civil Aeronautics Board last started an inquiry into the activities of Resort Airlines, Pinebluff, N. C.

Resort was certificated last year to provide all expense air travel between the

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U. S. and Mexico, the Caribbean area, South America and Canada. CAB will try to determine whether Resort has engaged illegally in activities an investigation between New York, N. Y., and Lake Placid-San Juan, N. Y., (as alleged by Colorado) and between New York and Mexico (as alleged by Eastern).

The Board will also look into possible illegal flights from New York to New Orleans and from Miami and West Palm Beach, Fla., to West End, Grand Bahama Island. Resort recently acquired a certificate for the latter run.

Whether Resort has disregarded its traffic or engaged in "unfair or deceptive methods of competition" are other issues involved in the case, which might lead to a cease and desist order. Resort now has three DC 3s and leases two C-46s.

Northwest Nonskeds Opposed by IAM

Nonscheduled airlines flying between Seattle and Alaska will be dealt a severe blow if a contract demand of the International Association of Machinists is granted.

The Alaskan airlines industry would like to continue using nonskeds for transporting mail cargo and from the territory during the fishing season. It would only require that the planes meet "air carrier specifications." But the union wants its members to make the Seattle-Alaska run only on the scheduled airlines, which have shared the business in the past with the nonskeds.

► **Scheduled:** Current Hawaii-Skinner industry officials accuse Pan American Airways and Northwest Airlines of favoring the union demand. The two scheduled carriers say it isn't so.

Real show behind the union demand seems abundant, believe it or not, the unhappy experience of a union official in a non-scheduled C-46 last season. He emerged with shattered nerves after a rough ride and is said to have sworn that the nonskeds operators "would bankrupt western 'bird class'" in the future—or else.

► **Troubled Water—IAM** is one of two major unions dealing with the airlines industry. Should the nonskeds get their demands, the other union—and larger—ones, the fishermen's, might act similarly. Result would be a major loss of revenue for Seattle-Alaska nonskeds, which are already plagued by Civil Aeronautics Board crackdowns and frequently cut-throat competition.

Hawaiian Lines Have Poor Year

Bragging competition to Hawaii's passenger air lines has proved an expensive waste.

Trans-Pacific Airlines, which last year won a CAB certificate to challenge Hawaiian Airlines' 20 year monopoly of Hawaiian scheduled air traffic, but reported a 1949 deficit of \$1,000,000. Of the loss, some \$100,000 was incurred converting to scheduled operations that started last June. The carrier does not fly on mail.

TPA's total deficit, adding its losses from the time the line was started in 1946, stands at \$751,000, according to President Rudy F. Toog. Stockholders have paid in assembly \$900,000.

► **On the Other Hand—Machinists:** Hawaiian Airlines reported a \$14,000 net profit in 1949—well below its 1948 earnings of \$93,000. Its passenger total fell from 145,000 in 1948 to 104,000 last year.

TPA in the last six months of 1949, when it was operating on a scheduled basis, loaded 41,000 passengers—substantially under the mark it had set itself. Reader blaming each other, both Hawaiian and TPA can blame some of their troubles on the May-Day-Guyver dock strike which slowed down business in the islands and severely throttled the tourist trade.

► **New Capital Sought—Negotiations** are now under way to get new capital to keep TPA going. These offers to buy Toog's stock are reported. TPA also is seeking a \$10,000 Reconstruction Finance Corp. loan.

Toog, it is understood, will sell his stock only if assured that the airlines will be kept operating and that recently stockholders will be protected. The company's stockholders' report cites two other possible sources of finance for TPA: insurance in a company not owned by Hawaiian and its parent company, later listed, Straits Navigation Co., and mail pay, which the carrier requested from CAB recently (Aircraft World, March 29).

Field Fire Protection Problems Discussed

Indianapolis—The present fight between the scheduled airlines and airports in the United States over which will pay the costs of a program of protection against fire accidents in commercial aviation will probably be worked out on an individual basis, the Committee on Aviation and Airport Fire Protection of the National Fire Protection Association said at its meeting here.

James Leavitt, President of Flight Safety Foundation, advised the 10 delegates that the problem was principally one of insurance but that it remained to be met. He cited an official report of 140 flames at LaGuardia Field in New York last year and six to date this year, as an indication that compe-

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Figure 2b is a more precise fit method using average results in laboratory tests—therefore, does not regard testing costs for the process.

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Civil Aviation Board granted the permit, with White House approval, in accordance with a bilateral air agreement now in effect between the U. S. and Canada. TCA plans to operate Canadian DC-4s twice a week at the route. Tentative schedule calls for two roundtrips weekly between Canadian ports and Tampa-St. Petersburg, one trip terminating at Nassau and the other at Kingston, Jamaica.

ALPA's Design for DC-3 Replacement

The Air Line Pilot Assn., which had hoped to say about the new Martin 202 and the Convairliner when these planes first appeared, has proposed its own specifications for a then-late transport to replace DC-3s.

Compared by ALPA's engineering and safety department and confirmed by the union's engineers, the specs call for a two-engine, triple-crew monoplane of either high wing or low-wing design. Plane would seat 30-35 passengers with two seats on each side of the aisle, and no passengers in the "perpeller danger zone." It should be able

to use DC-3 service and maintenance facilities.

ALPA says high speed is desirable, but not at a sacrifice of low landing speed.

SHORTLINES

► **All American**—Is planning large production pattern on the bulkhead opposite the entrance of its planes and may later consider selling the space to an advertiser.

► **American**—Reports its passengers can now order meals on its available on arrival at any of 50 points in the U. S. and Europe.

► **Arise Airways**—The California nonstop service obtained a temporary stay in the U. S. Court of Appeals for the District of Columbia against enforcement of a CAB regulation adopted late last year which gives the airlines between large regular carriers and their feeder agents. The CAB rule requires carriers to show they are not operating as a feeder, thus to prevent operation of carrier directly or through common carrier agents, and requires tickets to show which airlines it is to make the flight.

► **Boeing**—Has asked CAB for a certificate amendment designating New Orleans as a co-terminal with Houston on its Latin American route.

► **BCC**—Is conducting an experiment with white paint on top surfaces of Canadian transports operating from London to South America and the Far East. It is hoped that the paint will reduce the planes' cabin temperature by 12-15 deg. during stops at tropical airports. Similar tests have been made in the U. S.

► **Cab Aeromobiles Board**—Warned by past losses, has tightened its rules at practice on lines to permit foreign air carriers with CAB can operate a flight before the Board, directly or indirectly, on any matter which is handled while employed by the governmental agency. Neither may be an individual or corporation, obtained while he was with CAB unless the Board first gives its consent.

► **Delta**—Reported the best business in its history during February. Passenger mileage rose up 16 percent over the same 1949 month. Although flights had a low factor of around 91 percent and regular flights had a 79 percent load factor.

► **Flag**, Tigo Line—Has signed an in-flight freight agreement with Canada.

► **National**—Has a \$384,000 profit in February—best in company history and well over the \$331,000 profit for February, 1949. Revenues were up 26 percent over the comparable period last year and revenue passenger miles were 47 percent

► **Pan American**—Expects a record flow of tourists between the U. S. and Latin America this summer.

► **Railway Express Agency**—Recent Federal Reserve Commission action authorizing REA to boost rates 10 percent on first-class, two-day-cash rail shipments is expected to benefit air freight business. It is the fourth rate hike granted REA since the end of the war.

► **Sabena**—President Gilbert Ponce believes jet transports will be in a position to operate their efficiently with ground ground operations and air traffic control. The airline's basic Atlantic passenger traffic last year was about 50 percent over 1948, and 1950 should see further improvement.

► **TWA**—Designing low-cost 55 percent rate passengers from the U. S. to Rome than in the same period last year. Holy Year traffic was expected to swell over next winter during February.

► **United**—Seen will increase its cargo load substantially with a conversion of four passenger DC-6s into all-cargo planes. The conversions will be available this summer and have a 17,000-lb capacity, plus 100,000 cu ft of cargo space.

► **Washington National Airport**—Has started testing its new system of high intensity, slope line approach lights.

► **Winadine**, Central—Closed 48,511 passengers in its first two years of operation, which ended Feb. 28.

CAB SCHEDULE

- **Feb. 28**—Transferring enroute to the West Coast. Airlines may reach coast from Denver (1201).
- **Mar. 1**—Transferring enroute to the West Coast. Airlines may reach coast from Denver (1201).
- **Mar. 2**—Transferring enroute to the West Coast. Airlines may reach coast from Denver (1201).
- **Mar. 3**—Transferring enroute to the West Coast. Airlines may reach coast from Denver (1201).
- **Mar. 4**—Transferring enroute to the West Coast. Airlines may reach coast from Denver (1201).
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- **Mar. 31**—Transferring enroute to the West Coast. Airlines may reach coast from Denver (1201).

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AVIATION WEEK—MARCH 22, 1968

Advance Air Mfg. Company Agency—The Smith Company	41	Loren Engineering Co., The Agency—The Smith Company	49
Add Precision Products Corp. Agency—The Smith Company	34	Marleya Company Agency—Nashville, Tenn. & Bessie, Inc.	6
Airborne Associates Corp. Agency—White Thompson Associates	9	National Aeronautics Corp. Agency—B. K. Davis & Son	47
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Aircraft Spk. Ring Co., Inc. Agency—Spitz & Webb Ad.	2	Peter Applegate Company, The Agency—Fulton & Smith & Son, Inc.	23
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Clear Aircraft Co., Inc.	8	Sealed Airline Agency—Barnes Glass Company	36, 51
Clear Multigrip Corporation Agency—Barnes Glass Company & Co., Inc.	28	Shore Pacific Air of Boston Services Agency—Madison John & Adams, Inc.	41
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Fordell Engine & Aircraft Corp. Agency—J. H. Hudson, Inc.	3	Transcontinental & Western Airline Agency—Barnes Glass Company & Co., Inc.	49
General Electric Company Agency—C. M. Redford, Inc.	3	Van Dusen Aircraft Supplies Agency—Chas. A. White & Co.	32
Gibbs Company, The Agency—Madison John & Adams, Inc.	41	Wilson Electric Company Agency—Madison John & Adams, Inc.	12
Graham Corp., The Agency—Barnes Glass Company & Co., Inc.	3	Wick Manufacturing Company Agency—The Advertising Co.	16
Gussman Aircraft Engineering Co. Agency—Charles W. Hart Co., Inc.	3	Winters Gorden Company Agency—John W. Giffen Co., Inc.	18
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Harcos International Mfg. Co., The Agency—Fulton & Smith & Son, Inc.	21		
Helix Helicopters, Inc. Agency—Dean Gorden Business Adv.	10		
Jay Manufacturing Company Agency—Madison John & Adams, Inc.	46		
Loren Engineering Co., The Agency—Fulton & Smith & Son, Inc.	47		

Five enterprise is having another fling in the air transport industry. It is proving to be an energetic ghost—perhaps too energetic for its own good.

For the most part, untrammeled airline competition was laid to rest by the Civil Aeronautics Act of 1938. It tried to connect back through postwar unscheduled and common carriers. But the Civil Aeronautics Board has crushed down on many of these operations, ruling that they are in violation of the agency's economic regulations.

With interstate services under increasingly rigid controls, California Central Airlines tried its hand at scheduled intrastate flights between Los Angeles and San Francisco a little more than a year ago. Operating 28-passenger DC-3s at the three-cent-a-mile fare envisioned by C. R. Smith, the Burbank-based operator took on this imposing array of competition: the Southern Pacific, and Airwest, Topco and Santa Fe Railroad, three bus lines, including Pacific Coastway, four certificated airlines (United, TWA, Western and Southwest) and five other unlicensed airlines.

Thus far, Cal Central's gamble as free enterprise has paid off. Except for the first month of service it appears to have survived the black throughout 1968.

More importantly, the Los Angeles San Francisco run (one of the three most traveled air routes in the U. S.) has become a testing ground for how much air transportation the public will buy if the price is right. After complaints by surface carriers, and the remedy by certificated airlines to climb the intra-California coach haulage, attest to the drawing power of a three-cent airline. Still, Cal Central's success on the 350-mile Los Angeles San Francisco run could be duplicated on less, if any, other routes in the U. S. Such a low-fare, unlicensed operation requires a heavy natural traffic flow between two large cities located on the same state but far enough apart to bring out the airplane's time advantage over surface transportation.

Comparison of rail, bus, air transportation between Los Angeles and San Francisco during the past two years illustrates the tremendous impact of air coach. In 1948, before the advent of interstate air coach, the railroads handled 423,000 passengers (94.4 percent of the common carrier total) between the two California cities; buses accounted for 266,000 (28 percent) and the airlines 252,000 (27.6 percent).

But in 1948, the airlines, both certificated and unlicensed, were in first place, carrying 406,000 passengers or 43.1 percent of the total common carrier business. Rails last year handled only 306,000 passengers (32.7 percent) and buses 228,000 (24.2 percent). Total air coach rose 100 on the San Francisco-Los Angeles link last year, exceeded \$1.7 million.

EDITORIAL

The Impact of Air Coach

By the start of 1960, daily San Francisco-Los Angeles airline schedules—both first-class and coach—numbered 45. This compares with 11 railroad and 38 motorbus schedules.

The \$9.95 \$9.99 fare charged by the coach airlines on the intrastate run contrasts with \$19.15-\$21.05 (about 6 cents a mile) on regular airline flights; \$16.50-\$26.98 by rail; \$16.50-\$20.50 by rail coach; and \$5.15-\$5.65 by motorbus. Airline travel time of 2-3 hr. (airport-to-airport) compares with 5-6 hr. by rail or bus.

Survey made by the California Public Utilities Commission indicates that 41 percent of the Los Angeles-San Francisco air coach business comes from people who either would not have made the trip at all or would have used a private automobile. Around 34 percent of the air coach business was diverted from first class airline flights, 20 percent from the railroads and 5 percent from the buses.

When Cal Central carried over 2000 passengers during its first month of operation (January, 1968) and kept growing, because there were two reactions. One group of carriers—railroads, buses and certificated airlines—tried to get the California Public Utilities Commission, the Civil Aeronautics Board and even the labor unions to upset CCA's approval. Another group of unlicensed airlines jumped into the intrastate coach business themselves.

Headed by the coach competition, Western Air Lines President T. C. Decker later last July lashed out at the "unregulated" outside carriers for allegedly flying without proper safety regulations, combining the public with misleading advertisements, paying non-union wages and flying only when they had a profitable load. But little more than a month later, Western Air Lines of California (of unlicensed passengers) began \$9.95 Los Angeles-San Francisco coach flights using not only high-density DC-4s leased from Western, but also Western crews, maintenance, dispatching, communications and holding facilities.

WALC made money from the start and soon was carrying more passengers than Cal Central (Aviation Week Feb. 6). The month, Western was ready to ask CAB permission to conduct \$9.95 Los Angeles-San Francisco coach flights under its own name.

United Air Lines complained bitterly to CAB against Western of California, characterizing the carrier as "a new incarnation of Western" set up in possible violation of the Civil Aeronautics Act. Cal Central filed a \$500,000 damage suit against WALC and WALC, charging violation of the state's antitrust law, unfair trade practices, libel and slander.

(Continued on page 54)

EDITORIAL

(Continued from page 53)

But now UAL has decided to fight fire with fire. Still convinced that an coach is "an economic issue," United over-rides these plans to ask CAB permission to start three-coach flights between Los Angeles and San Francisco on May 14 with 70-passenger DC-6s. Use of DC-6s might well play hob with present DC-4 and DC-3 operations.

Meanwhile, the question of whether three-coach route interstate coach services are in economic was decided in the negative by the California Public Utilities Commission on March 14. It said that the \$999,999 fare is sufficient to return operating costs and yield some profit—as proved in the case of Western of California and Cal Central.

In dropping its investigation of the cut rate airlines, the commission conceded it a problematical whether these carrier can continue to show profits in the future if competition intensifies.

Col. C. C. Sherman, Cal Central president, has had long experience with interstate air coach operations. He was general manager of Airline Transport Carriers, Inc., which since 1946 has been one of the major non-scheduled interstate coach operations.

As happen sooner or later to almost all airlines, ATC last fall became the object of CAB enforcement action. The company was prohibited from making more than eight roundtrips between any two interstate points during any four consecutive weeks.

Thus restricted in its coast-to-coast operations, ATC was doubly glad that some of its planes and crews were being loaned to Cal Central for interstate flights that presumably are beyond CAB's economic jurisdiction.

Last year, with a fleet of nine DC-3s, Cal Central flew more than 91,000 passengers without mishap. Col. Sherman, a World War II pilot, frequently takes over the controls on his company's flights. He says Cal Central's safety standards are in line with scheduled interstate carriers and fully meet CAB's stringent requirements.

According to Sherman, Cal Central showed "an appreciable profit" during its first year, but he gives no figures. However, the California Public Utilities Commission estimates that during the first 33 months of 1949 CCA made well over ten percent profit on its investment.

In an act against Western, Sherman contends that the "financing" company created Western of California as a "flying squad" for Cal Central and other interstate lines—some of whom were forced out of business when WACC appeared on the scene. But with a wary eye on United's DC-6 coach proposal, Sherman is going ahead with plans to boost his DC-3's capacity to 72 passengers and bid for even more business.

Sherman is moving once again that his enterprise doesn't die easily. If it did, air coach might still be running from the U.S. air transportation scene.

—C. L. A.

An Editorial Apology

Last March 28 on this page we ventured our editorial opinion that United Air Lines was making "an honest mistake" in its refusal to consider air coach service.

We then wrote: "We also predict that UAL will have a lower fare schedule well within six months." Immediately thereafter we received several unofficial and indiscreet comments from United people to the effect that their organization would "never" consider air coach service.

Now, United, as the last major airline holdout, has filed with the Civil Aeronautics Board its intention to start coach operations with DC-6s on the already heavily competitive San Francisco-Los Angeles segment May 14, where low fares were pioneered by the airlines.

It was inevitable that United eventually would be compelled to start an coach service. But the month-long period of our forecast was up as long ago as Sept. 28. We regret this inaccuracy and apologize to our readers.

P. S. In the same editorial March 28 we also said, "And if American doesn't enter the coach picture before long we will abandon all attempts at forecasting." American started in December.

Wanted: Teamwork

The Air Transport Association's Executive Vice President, Robert Ranspach, made an address before the TWA Management Club that is deserving of more attention.

"One of the major problems facing the airlines . . . is the adoption of a unified public relations program," he said. "It should be confined to major principles and should be implemented by each member company of the ATA. Since I came with the Association in January 1946 we have had no industry public relations program. In fact, we have had no industry program. We have been waiting until the fire bell rang—then we rush out to stop the fire. That is defensive action only. We need a positive program."

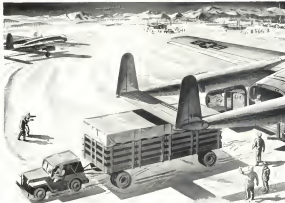
Mr. Ranspach, who came to ATA from the House of Representatives as one of the most distinguished members that body ever had, says this positive program should deal with employee relations, community relations, customer relations and governmental relations.

"What we need as this industry is team work. Let us give the facts to our employees, to the communities we serve, and to the public—also to our public officials, federal, state and local."

Mr. Ranspach knows what he is talking about. The various members of the ATA have everything to gain and nothing to lose by close cooperation.

No transportation industry ever had such a glaucous or more imaginative service to sell the American people as stage, positive, cooperative (cooperate) to "fly the mail line" has great possibilities. The people want to fly. First give them a chance with good, safe service at low fares. Then sell.

—Robert H. Wood



DELIVERY —

Via the Air Route

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Fairchild C-119 Packets, now to be flying for the Military Air Transport Service, help fulfill this vital air transportation mission. Capable of carrying 64 passengers or 16 tons of cargo, this two-engine transport and cargo plane has the versatility to accomplish numerous types of operations required by the MATS Air Route.

The C-119's unique cargo loading at truck-level

height allows for rapid handling of cargo, eliminating the necessity for extra ground handling equipment. Airplane engines and parts, bulky communication equipment, vehicles, trucks and field kitchens are some of the many military items the Fairchild C-119 carries with ease. In addition to its utility as a cargo plane, the Packet is equally efficient for evacuation, on-on rescue, and personnel transport.

The C-119 is one of a series of Fairchild transport planes which will continue to play a considerable role in the operations of the world-wide Military Air Transport Service.



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